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Formation and Development of the Dynamic Stall Vortex on a Wing with Leading Edge Tubercles[1] JOHN HRYNUK, Army Research Lab - Vehicles Technology Directorate, DOUGLAS BOHL, Clarkson University — Humpback whales are unique in that their flippers have leading edge "bumps" or tubercles. Past work on airfoils inspired by whale flippers has centered on the static aerodynamic characteristics of these airfoils. The current study uses Molecular Tagging Velocimetry (MTV) to investigate the effects of tubercles on dynamically pitching NACA 0012 airfoils. A baseline (i.e. straight leading edge) wing and one modified with leading edge tubercles are investigated. Tracking of the Dynamic Stall Vortex (DSV) is performed to quantitatively compare the DSV formation location, path, and convective velocity for tubercled and baseline wings. The results show that there is a spanwise variation in the initial formation location and motion of the DSV on the modified wing. Once formed, the DSV aligns into a more uniform spanwise structure. As the pitching motion progresses, the DSV on the modified wing convects away from the airfoil surface later and slower than is observed for the baseline airfoil. The results indicate that the tubercles may delay stall when compared to the baseline airfoil.

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